

# SEQUENCE LISTING

<110> Sewalt, Vincent J. H.  
Jung, Rudolf  
Hu, Wang-Nan  
Meeley, Robert B.

<120> Improved Grain Quality Through Altered  
Expression of Seed Proteins

<130> 1276

<150> US 60/246,455

<151> 2000-11-07

<160> 10

<170> FastSEQ for Windows Version 3.0

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<212> DNA

<213> Zea mays

<220>

<221> CDS

<222> (120)...(1004)

<223> 50 kD gamma-zein prolamin/PTA 2272

<400> 1

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atg aag ctg gtg ctt gtg gtt ctt gct ttc att gct tta gta tca agt      167
Met Lys Leu Val Leu Val Val Leu Ala Phe Ile Ala Leu Val Ser Ser
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gtt tct tgt aca cag aca ggc ggc tgc agc tgt ggt caa caa caa agc      215
Val Ser Cys Thr Gln Thr Gly Gly Cys Ser Cys Gly Gln Gln Gln Ser
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cat gag cag caa cat cat cca caa caa cat cat cca caa aaa caa caa      263
His Glu Gln Gln His His Pro Gln Gln His His Pro Gln Lys Gln Gln
          35             40             45

cat caa cca cca cca caa cat cac cag cag cag caa cac caa caa caa      311
His Gln Pro Pro Pro Gln His His Gln Gln Gln Gln His Gln Gln Gln
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caa gtt cac atg caa cca caa aaa cat cag caa caa caa gaa gtt cat      359
Gln Val His Met Gln Pro Gln Lys His Gln Gln Gln Gln Glu Val His
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gtt caa caa caa caa caa caa ccg cag cac caa caa caa caa caa caa      407
Val Gln Gln Gln Gln Gln Gln Pro Gln His Gln Gln Gln Gln Gln Gln

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85	90	95	
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caa caa tca caa ggc cat gtg caa caa cac gaa cag agc cat gag caa Gln Gln Ser Gln Gly His Val Gln Gln His Glu Gln Ser His Glu Gln 115 120 125			503
cac caa gga cag agc cat gag caa caa cat caa caa caa ttc cag ggt His Gln Gly Gln Ser His Glu Gln Gln His Gln Gln Gln Phe Gln Gly 130 135 140			551
cat gac aag cag caa caa cca caa cag cct cag caa tat cag cag ggc His Asp Lys Gln Gln Gln Pro Gln Gln Pro Gln Gln Tyr Gln Gln Gly 145 150 155 160			599
cag gaa aaa tca caa cag caa caa tgt cat tgc cag gag cag caa cag Gln Glu Lys Ser Gln Gln Gln Gln Cys His Cys Gln Glu Gln Gln Gln 165 170 175			647
act aca agg tgc agc tat aac tac tat agc agt agc tca aat cta aaa Thr Thr Arg Cys Ser Tyr Asn Tyr Tyr Ser Ser Ser Ser Asn Leu Lys 180 185 190			695
aat tgt cat gaa ttc cta agg cag cag tgc agc cct ttg gta atg cct Asn Cys His Glu Phe Leu Arg Gln Gln Cys Ser Pro Leu Val Met Pro 195 200 205			743
ttt ctc caa tca cgt ttg ata caa cca agt agc tgc cag gta ttg cag Phe Leu Gln Ser Arg Leu Ile Gln Pro Ser Ser Cys Gln Val Leu Gln 210 215 220			791
caa caa tgt tgt cat gat ctt agg cag att gag cca caa tac att cac Gln Gln Cys Cys His Asp Leu Arg Gln Ile Glu Pro Gln Tyr Ile His 225 230 235 240			839
caa gca atc tac aac atg gtt caa tcc ata atc cag gag gag caa caa Gln Ala Ile Tyr Asn Met Val Gln Ser Ile Ile Gln Glu Glu Gln Gln 245 250 255			887
caa caa cca tgt gag tta tgt gga tct caa caa gct act cca aag tgc Gln Gln Pro Cys Glu Leu Cys Gly Ser Gln Gln Ala Thr Pro Lys Cys 260 265 270			935
ggg ggc aat ctt gac agc agc aca ata cct acc atc aat gtg cgg ctt Gly Gly Asn Leu Asp Ser Ser Thr Ile Pro Thr Ile Asn Val Arg Leu 275 280 285			983
gta cca ctc ata cta cca aaa taatccatgc agcagcaatg acattagtgg Val Pro Leu Ile Leu Pro Lys 290 295			1034
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 <213> Zea mays

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 His Glu Gln Gln His His Pro Gln Gln His His Pro Gln Lys Gln Gln  
 35 40 45  
 His Gln Pro Pro Pro Gln His His Gln Gln Gln Gln His Gln Gln Gln  
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 Gln Val His Met Gln Pro Gln Lys His Gln Gln Gln Gln Glu Val His  
 65 70 75 80  
 Val Gln Gln Gln Gln Gln Gln Pro Gln His Gln Gln Gln Gln Gln Gln  
 85 90 95  
 Gln Gln His Gln Gln Gln His Gln Cys Glu Gly Gln Gln Gln His His  
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 Gln Gln Ser Gln Gly His Val Gln Gln His Glu Gln Ser His Glu Gln  
 115 120 125  
 His Gln Gly Gln Ser His Glu Gln Gln His Gln Gln Gln Phe Gln Gly  
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 His Asp Lys Gln Gln Gln Pro Gln Gln Pro Gln Gln Tyr Gln Gln Gly  
 145 150 155 160  
 Gln Glu Lys Ser Gln Gln Gln Gln Cys His Cys Gln Glu Gln Gln Gln  
 165 170 175  
 Thr Thr Arg Cys Ser Tyr Asn Tyr Tyr Ser Ser Ser Ser Asn Leu Lys  
 180 185 190  
 Asn Cys His Glu Phe Leu Arg Gln Gln Cys Ser Pro Leu Val Met Pro  
 195 200 205  
 Phe Leu Gln Ser Arg Leu Ile Gln Pro Ser Ser Cys Gln Val Leu Gln  
 210 215 220  
 Gln Gln Cys Cys His Asp Leu Arg Gln Ile Glu Pro Gln Tyr Ile His  
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 Gln Ala Ile Tyr Asn Met Val Gln Ser Ile Ile Gln Glu Glu Gln Gln  
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 Gln Gln Pro Cys Glu Leu Cys Gly Ser Gln Gln Ala Thr Pro Lys Cys  
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                                     1

aag atc gcc gcg gcg gcg gcg gcg gcg ctg tgc ttc gcg gcc ctg gtg 164
Lys Ile Ala Ala Ala Ala Ala Ala Ala Leu Cys Phe Ala Ala Leu Val
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gcc gtg gcc gtc tgc caa ggc gag gtc gag cgg cag agg ctc agg gac 212
Ala Val Ala Val Cys Gln Gly Glu Val Glu Arg Gln Arg Leu Arg Asp
      20              25              30

ctg cag tgc tgg cag gag gtc cag gag agc ccg ctc gac gcg tgc cgc 260
Leu Gln Cys Trp Gln Glu Val Gln Glu Ser Pro Leu Asp Ala Cys Arg
      35              40              45              50

cag gtc ctc gac cgg cag cta acc ggc ggc ggc ggc ggc ggc ggc gtt 308
Gln Val Leu Asp Arg Gln Leu Thr Gly Gly Gly Gly Gly Gly Gly Val
      55              60              65

ggc ccg ttc cgg tgg ggc acc ggg ctc cgg atg cgg tgc tgc cag cag 356
Gly Pro Phe Arg Trp Gly Thr Gly Leu Arg Met Arg Cys Cys Gln Gln
      70              75              80

ctc cag gac gtg agc cgc gag tgc cgc tgc gcc gcc atc cgg agc atg 404
Leu Gln Asp Val Ser Arg Glu Cys Arg Cys Ala Ala Ile Arg Ser Met
      85              90              95

gtc agg ggc tac gag gag gcc atg ccg ccg ctg gag aaa ggc tgg tgg 452
Val Arg Gly Tyr Glu Glu Ala Met Pro Pro Leu Glu Lys Gly Trp Trp
      100              105              110

cca tgg ggg cgg cag cag cag ccg ccg ccg cag gga gga gga gga gga 500
Pro Trp Gly Arg Gln Gln Gln Pro Pro Pro Gln Gly Gly Gly Gly Gly
      115              120              125              130

cag ggg ggc tac tac tac ccc tgc agc cgg cca gga gag gga tac ggc 548
Gln Gly Gly Tyr Tyr Tyr Pro Cys Ser Arg Pro Gly Glu Gly Tyr Gly
      135              140              145

tac ggt cag ggt ggc cag ccg cag atg tat cca ccg tgt cgt ccc ggc 596
Tyr Gly Gln Gly Gly Gln Arg Gln Met Tyr Pro Pro Cys Arg Pro Gly
      150              155              160

acc acc ggc ggc ggg cca agg atc ggc cgc gtg agg ctt acg aag gcc 644
Thr Thr Gly Gly Gly Pro Arg Ile Gly Arg Val Arg Leu Thr Lys Ala
      165              170              175

cgg gag tac gcc gcg ggg ttg ccg atg atg tgc cgg ctg tcg gag ccc 692
Arg Glu Tyr Ala Ala Gly Leu Pro Met Met Cys Arg Leu Ser Glu Pro
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cag gag tgc agc atc ttc tcc ggc ggc gac cag tac tagctaccat 738
Gln Glu Cys Ser Ile Phe Ser Gly Gly Asp Gln Tyr

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195 200 205

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 35 40 45  
 Cys Arg Gln Val Leu Asp Arg Gln Leu Thr Gly Gly Gly Gly Gly  
 50 55 60  
 Gly Val Gly Pro Phe Arg Trp Gly Thr Gly Leu Arg Met Arg Cys Cys  
 65 70 75 80  
 Gln Gln Leu Gln Asp Val Ser Arg Glu Cys Arg Cys Ala Ala Ile Arg  
 85 90 95  
 Ser Met Val Arg Gly Tyr Glu Glu Ala Met Pro Pro Leu Glu Lys Gly  
 100 105 110  
 Trp Trp Pro Trp Gly Arg Gln Gln Gln Pro Pro Pro Gln Gly Gly Gly  
 115 120 125  
 Gly Gly Gln Gly Gly Tyr Tyr Tyr Pro Cys Ser Arg Pro Gly Glu Gly  
 130 135 140  
 Tyr Gly Tyr Gly Gln Gly Gly Gln Arg Gln Met Tyr Pro Pro Cys Arg  
 145 150 155 160  
 Pro Gly Thr Thr Gly Gly Gly Pro Arg Ile Gly Arg Val Arg Leu Thr  
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 Glu Pro Gln Glu Cys Ser Ile Phe Ser Gly Gly Asp Gln Tyr  
 195 200 205

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<220>  
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Ser	Gly	Gln	Val	Arg	Pro	Leu	Pro	Ser	Ser	Leu	Pro	Leu	Ser	Leu	Leu		
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ctg	ctc	ctc	ctc	ctg	tgc	tgc	tcc	ggc	acc	tcg	tgg	gga	tgg	agc	acg	150	
Leu	Leu	Leu	Leu	Leu	Cys	Cys	Ser	Gly	Thr	Ser	Trp	Gly	Trp	Ser	Thr		
25					30					35							
tcc	cgg	gga	gga	gcc	gcc	agg	gag	tgc	ggc	ttc	gat	ggc	aag	ctg	gag	198	
Ser	Arg	Gly	Gly	Ala	Ala	Arg	Glu	Cys	Gly	Phe	Asp	Gly	Lys	Leu	Glu		
40					45					50					55		
gcc	ctg	gag	cgg	cgc	cac	aag	gtg	cag	tct	gag	gcc	ggc	tcc	gtc	cag	246	
Ala	Leu	Glu	Pro	Arg	His	Lys	Val	Gln	Ser	Glu	Ala	Gly	Ser	Val	Gln		
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tac	ttc	agc	cgg	ttc	aac	gaa	gcc	gac	cgg	gag	ctc	acc	tgc	gcc	ggc	294	
Tyr	Phe	Ser	Arg	Phe	Asn	Glu	Ala	Asp	Arg	Glu	Leu	Thr	Cys	Ala	Gly		
75						80					85						
atc	ttc	gcc	gtc	cgc	gtc	gtc	gtc	gac	gcc	atg	ggc	ctc	ctg	ctc	cct	342	
Ile	Phe	Ala	Val	Arg	Val	Val	Val	Asp	Ala	Met	Gly	Leu	Leu	Leu	Pro		
90						95					100						
cga	tac	tcc	aac	gtc	cat	tcg	ctt	gtc	tac	atc	gtc	caa	ggg	aga	ggg	390	
Arg	Tyr	Ser	Asn	Val	His	Ser	Leu	Val	Tyr	Ile	Val	Gln	Gly	Arg	Gly		
105						110					115						
atc	att	ggg	ttc	tcg	ttt	ccg	gga	tgc	caa	gag	gag	acc	cag	cag	cag	438	
Ile	Ile	Gly	Phe	Ser	Phe	Pro	Gly	Cys	Gln	Glu	Glu	Thr	Gln	Gln	Gln		
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cag	tat	gga	tac	gga	tat	gga	tat	gga	cac	cat	cac	cat	cag	cat	gac	486	
Gln	Tyr	Gly	Tyr	Gly	Tyr	Gly	Tyr	Gly	His	His	His	His	Gln	His	Asp		
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cac	cac	aag	atc	cac	cga	ttc	gag	cag	ggc	gac	gtg	gtg	gcc	atg	ccg	534	
His	His	Lys	Ile	His	Arg	Phe	Glu	Gln	Gly	Asp	Val	Val	Ala	Met	Pro		
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gcc	ggc	gcc	cag	cac	tgg	ctg	tac	aac	gac	ggc	gac	gcg	ccg	ctt	gtg	582	
Ala	Gly	Ala	Gln	His	Trp	Leu	Tyr	Asn	Asp	Gly	Asp	Ala	Pro	Leu	Val		
170						175					180						
gcg	gtc	tac	gtc	ttc	gac	gag	aac	aac	aac	atc	aac	cag	ctc	gag	cct	630	
Ala	Val	Tyr	Val	Phe	Asp	Glu	Asn	Asn	Asn	Ile	Asn	Gln	Leu	Glu	Pro		
185						190					195						
tcc	atg	agg	aaa	ttt	ttg	ctg	gct	ggg	ggc	ttc	agc	aag	ggg	cag	ccc	678	
Ser	Met	Arg	Lys	Phe	Leu	Leu	Ala	Gly	Gly	Phe	Ser	Lys	Gly	Gln	Pro		
200					205					210					215		
cac	ttc	gcc	gag	aac	atc	ttc	aaa	ggg	atc	gac	gcc	cgg	ttc	ctg	agc	726	
His	Phe	Ala	Glu	Asn	Ile	Phe	Lys	Gly	Ile	Asp	Ala	Arg	Phe	Leu	Ser		
				220					225					230			
gaa	gcc	ctg	ggc	gtc	agc	atg	cac	gtc	gcc	gag	aag	ctg	cag	agc	cgg	774	

Glu	Ala	Leu	Gly	Val	Ser	Met	His	Val	Ala	Glu	Lys	Leu	Gln	Ser	Arg		
			235					240					245				
cgt	gac	cag	cga	ggc	gag	atc	gtc	cgc	gtg	gag	ccg	gag	cac	ggc	ttt	822	
Arg	Asp	Gln	Arg	Gly	Glu	Ile	Val	Arg	Val	Glu	Pro	Glu	His	Gly	Phe		
		250					255					260					
cac	cag	ctg	aat	ccg	tcg	ccg	tcg	tcg	tcg	tcg	ttt	tcg	ttc	cca	tcg	870	
His	Gln	Leu	Asn	Pro	Ser	Pro	Ser	Ser	Ser	Ser	Phe	Ser	Phe	Pro	Ser		
		265					270					275					
tca	caa	gtc	cag	tac	caa	acg	tgc	cag	cgc	gac	gtc	gac	agg	cac	aac	918	
Ser	Gln	Val	Gln	Tyr	Gln	Thr	Cys	Gln	Arg	Asp	Val	Asp	Arg	His	Asn		
		280				285				290					295		
gtc	tgc	gcc	atg	gag	gtg	agg	cac	agc	gtc	gaa	cgg	ctg	gac	cag	gcc	966	
Val	Cys	Ala	Met	Glu	Val	Arg	His	Ser	Val	Glu	Arg	Leu	Asp	Gln	Ala		
				300					305					310			
gac	gtc	tac	agc	cct	ggg	gct	ggg	agg	atc	aca	cgc	ctc	acc	agc	cac	1014	
Asp	Val	Tyr	Ser	Pro	Gly	Ala	Gly	Arg	Ile	Thr	Arg	Leu	Thr	Ser	His		
			315					320					325				
aag	ttc	ccc	gtc	ctc	aac	ctc	gta	cag	atg	agc	gcg	gtg	cgg	gta	gac	1062	
Lys	Phe	Pro	Val	Leu	Asn	Leu	Val	Gln	Met	Ser	Ala	Val	Arg	Val	Asp		
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ctg	tac	cag	gac	gcc	atc	atg	tcg	ccg	ttc	tgg	aac	ttc	aac	gcc	cac	1110	
Leu	Tyr	Gln	Asp	Ala	Ile	Met	Ser	Pro	Phe	Trp	Asn	Phe	Asn	Ala	His		
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agc	gcc	atg	tac	ggc	atc	agg	ggc	agt	gca	agg	gtc	cag	gtc	gcc	agc	1158	
Ser	Ala	Met	Tyr	Gly	Ile	Arg	Gly	Ser	Ala	Arg	Val	Gln	Val	Ala	Ser		
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Asp	Asn	Gly	Thr	Thr	Val	Phe	Asp	Asp	Val	Leu	Arg	Ala	Gly	Gln	Leu		
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ctc	atc	gta	ccc	cag	ggc	tac	ctc	gtc	gcc	acc	aag	gcg	cag	gga	gaa	1254	
Leu	Ile	Val	Pro	Gln	Gly	Tyr	Leu	Val	Ala	Thr	Lys	Ala	Gln	Gly	Glu		
			395					400					405				
ggc	ttc	cag	tac	atc	gcc	ttc	gag	acg	aac	cct	gac	acc	atg	gtc	agc	1302	
Gly	Phe	Gln	Tyr	Ile	Ala	Phe	Glu	Thr	Asn	Pro	Asp	Thr	Met	Val	Ser		
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cac	gtc	gcc	ggg	aag	aac	tcc	gtc	ctg	agc	gac	ttg	ccg	gcc	gcc	gtc	1350	
His	Val	Ala	Gly	Lys	Asn	Ser	Val	Leu	Ser	Asp	Leu	Pro	Ala	Ala	Val		
		425				430					435						
atc	gcc	agc	tcg	tat	gcc	atc	tcc	atg	gag	gaa	gct	gca	gag	ctc	aag	1398	
Ile	Ala	Ser	Ser	Tyr	Ala	Ile	Ser	Met	Glu	Glu	Ala	Ala	Glu	Leu	Lys		
		440				445				450					455		
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Asn Gly Arg Lys His Glu Leu Ala Val Leu Thr Pro Ala Gly Ser Gly  
460 465 470

agc tac caa caa ggt caa gct ggc agc gcc caa cag tag gcacaacctc 1495  
Ser Tyr Gln Gln Gly Gln Ala Gly Ser Ala Gln Gln \*  
475 480

agagtgatct gcctgaataa gtactcgtag actgtaataa ttaaacaaag cttgctcatg 1555  
gttaaactgc gtgttgatta gtctttcaac tacatagctc taaagttttt gatacaccga 1615  
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<213> Zea mays

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35 40 45  
Gly Phe Asp Gly Lys Leu Glu Ala Leu Glu Pro Arg His Lys Val Gln  
50 55 60  
Ser Glu Ala Gly Ser Val Gln Tyr Phe Ser Arg Phe Asn Glu Ala Asp  
65 70 75 80  
Arg Glu Leu Thr Cys Ala Gly Ile Phe Ala Val Arg Val Val Val Asp  
85 90 95  
Ala Met Gly Leu Leu Leu Pro Arg Tyr Ser Asn Val His Ser Leu Val  
100 105 110  
Tyr Ile Val Gln Gly Arg Gly Ile Ile Gly Phe Ser Phe Pro Gly Cys  
115 120 125  
Gln Glu Glu Thr Gln Gln Gln Gln Tyr Gly Tyr Gly Tyr Gly Tyr Gly  
130 135 140  
His His His His Gln His Asp His His Lys Ile His Arg Phe Glu Gln  
145 150 155 160  
Gly Asp Val Val Ala Met Pro Ala Gly Ala Gln His Trp Leu Tyr Asn  
165 170 175  
Asp Gly Asp Ala Pro Leu Val Ala Val Tyr Val Phe Asp Glu Asn Asn  
180 185 190  
Asn Ile Asn Gln Leu Glu Pro Ser Met Arg Lys Phe Leu Leu Ala Gly  
195 200 205  
Gly Phe Ser Lys Gly Gln Pro His Phe Ala Glu Asn Ile Phe Lys Gly  
210 215 220  
Ile Asp Ala Arg Phe Leu Ser Glu Ala Leu Gly Val Ser Met His Val  
225 230 235 240  
Ala Glu Lys Leu Gln Ser Arg Arg Asp Gln Arg Gly Glu Ile Val Arg  
245 250 255  
Val Glu Pro Glu His Gly Phe His Gln Leu Asn Pro Ser Pro Ser Ser  
260 265 270  
Ser Ser Phe Ser Phe Pro Ser Ser Gln Val Gln Tyr Gln Thr Cys Gln  
275 280 285  
Arg Asp Val Asp Arg His Asn Val Cys Ala Met Glu Val Arg His Ser  
290 295 300



Val Glu Arg Leu Asp Gln Ala Asp Val Tyr Ser Pro Gly Ala Gly Arg  
 305 310 315 320  
 Ile Thr Arg Leu Thr Ser His Lys Phe Pro Val Leu Asn Leu Val Gln  
 325 330 335  
 Met Ser Ala Val Arg Val Asp Leu Tyr Gln Asp Ala Ile Met Ser Pro  
 340 345 350  
 Phe Trp Asn Phe Asn Ala His Ser Ala Met Tyr Gly Ile Arg Gly Ser  
 355 360 365  
 Ala Arg Val Gln Val Ala Ser Asp Asn Gly Thr Thr Val Phe Asp Asp  
 370 375 380  
 Val Leu Arg Ala Gly Gln Leu Leu Ile Val Pro Gln Gly Tyr Leu Val  
 385 390 395 400  
 Ala Thr Lys Ala Gln Gly Glu Gly Phe Gln Tyr Ile Ala Phe Glu Thr  
 405 410 415  
 Asn Pro Asp Thr Met Val Ser His Val Ala Gly Lys Asn Ser Val Leu  
 420 425 430  
 Ser Asp Leu Pro Ala Ala Val Ile Ala Ser Ser Tyr Ala Ile Ser Met  
 435 440 445  
 Glu Glu Ala Ala Glu Leu Lys Asn Gly Arg Lys His Glu Leu Ala Val  
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 acaacagcac caacaacaac atcaatgtga aggccaacaa caacatcacc aacaatcaca 180  
 aggccatgtg caacaacacg aacagagcca tgagcaacac caaggacaga gccatgagca 240  
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 atatcagcag ggccaggaaa aatc 324

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<220>  
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 <223> 50kD gamma-zein, Mol7 partial

<400> 8  
 ccagcagcag caacaccaac aacaacaagt tcacatgcaa ccacaaaaac atcagcaaca 60  
 acaagaagtt catgttcaac aacaacaaca acaaccgcag caccaacaac aacaacaaca 120

